# NEW ALLOYS OF THE Ti-5Mo-Nb SYSTEM, WITH LOW ELASTIC MODULUS, FOR BIOMEDICAL APPLICATIONS

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## ABSTRACT

Among the most usually utilized materials for biomedical applications are the cp-Ti and its alloys due to their excellent corrosion resistance, mechanical and tribological properties, and biocompatibility, in addition to promoting good osseointegration. Ti-6Al-4V is one of the alloys most used for the manufacture of implants. However, some studies have shown that V is cytotoxic, and Al ions in the body may be associated with some neurological disorders, such as Alzheimer's disease. Therefore, new Ti alloys have been developed without the presence of V and Al. Mo and Nb are two non-cytotoxic β-stabilizing elements that reduce the elastic modulus of titanium alloys. Thus, this study aims to develop and characterize, new Ti-5Mo-xNb alloys (x = 0, 10, 20 and 30 wt%). The ingots were cast in an argon-controlled atmosphere arc-melting furnace. Then, they underwent a homogenization heat treatment at 1000 °C for 24 hours in a vacuum of $10^{-7}$ torr. Subsequently, the ingots were hot rolled to obtain a regular shape for future analysis. Finally, another annealing heat treatment was performed to relieve the stresses of hot rolling. Chemical characterization was carried out, where density and chemical composition were measured. Information on the structure and microstructure of the alloys were obtained by X-ray diffraction and optical (OM) and scanning electron (SEM) micrographs images. Also, microhardness and elastic modulus analyzes were performed for the mechanical characterization. Finally, MTT and crystal violet tests were performed to assess the cytotoxicity and cell adhesion of the alloys. The results indicated that the alloys have low-density values, slightly above cp-Ti. As the content of Nb increases, the

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X-ray diffractograms and micrographs showed that the amount of β-phase also increases. The modulus of elasticity values remained below the Ti-cp, and biological tests indicated that the alloys are not cytotoxic, demonstrating properties of alloys with potential for future biomedical applications.

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